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MINISTRY OF SCIENCES AND HIGHER EDUCATION OF THE REPUBLIC OF KAZAKHSTAN

M.O. AUEZOV SOUTH KAZAKHSTAN UNIVERSITY

«APPROVED»

Chairman of the board

Rector

Doctor of historical sciences,

Academician Kozhamzharova D.P.

23 02 2023



### EDUCATIONAL PROGRAM

7M05310-Physics

Registration number	7M05300004
Code and classification of the field of education	7M05 Natural sciences, mathematics and statistics
Code and classification of areas of study	7M053 - Physical chemical sciences
Group of educational programs	M090 Physics
OP type	Acting
ISCED level	7
NQF level	7
IQF level	7
Language of instruction	Kazakh Russian
The complexity of EP	120 credits
Distinctive features of EP	-
Partner University (JEP) -	-
University partner (DDEP) -	-

Shymkent, 2023

Drafters:

FULL NAME.	Position	signature
Tursunbaev A.S.	Head of the Department «Physics», Ph.D.	
Saidakhmetov P. A.	Candidate of Physics and Mathematics, ass.professor.	
Turmambekov T.A.	Doctor of Physics and Mathematics, Professor	
Spabekova R.S.	Candidate of Chemical Sciences, Professor	
Abdraimov R.T.	master of physics	
Baubekova G.M.	master of physics	
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Ualikhanov Bayan Saparbekovna	Head of the department «Physics» of the South Kazakhstan State Pedagogical University. PhD.	
Isaev E.B.	Public Association of the Ecological Society «BIOS»	
Usibali T.O.	LLP «Ontustik-Kurylys TU»	
Myrzasalieva A.S.	Director South Kazakhstan Humanitarian and Economic College	

The EP was considered in the direction of training \_\_\_\_\_ at a meeting of the academic committee, Minutes # 4a «10» 02 2023 y.

Chairman of the Committee  Madiyarov N.K.

The EP was considered and recommended for approval at Educational-methodical meeting of M. Auezov SKU Minutes # 4\* «22» 02 2023 y.

Chairman of the UMS  Abisheva R.D.

The EP was approved by the decision of the Academic Council of the University Minutes # 13 «23» 02 2023 y.

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## 1. PROGRAM CONCEPT

<b>University mission</b>	Generation of new competencies, preparation of a leader who translates research and entrepreneurial thinking and culture
<b>University values</b>	<ul style="list-style-type: none"><li>• Openness - open to change, innovation and cooperation.</li><li>• Creativity – generates ideas, develops them and turns them into values.</li><li>• Academic freedom - <b>free in choice, development and action.</b></li><li>• Partnership - creates trust and support in relationships where everyone wins.</li><li>• Social responsibility - ready to fulfill obligations, make decisions and be responsible for their results.</li></ul>
<b>Model of graduate</b>	<ul style="list-style-type: none"><li>• Deep subject knowledge, its application and constant expansion in professional activities.</li><li>• Information and digital literacy and mobility in a rapidly changing environment.</li><li>• Research skills, creativity and emotional intelligence.</li><li>• Entrepreneurship, independence and responsibility for self-activity and well-being.</li><li>• Global and national citizenship, tolerance for cultures and languages.</li></ul>
<b>Uniqueness of EP</b>	<ul style="list-style-type: none"><li>• Orientation to the regional labor market and social order through the formation of professional competencies of the graduate, adjusted to the requirements of stakeholders.</li><li>• Practice orientation and emphasis on the development of critical thinking and entrepreneurship, the formation of a wide range of skills that will allow you to be functionally literate and competitive in any life situation and be in demand in the labor market.</li></ul>
<b>Academic Integrity and Ethics Policy</b>	<p>The university has taken measures to maintain academic honesty and academic freedom, protection from any kind of intolerance and discrimination:</p> <ul style="list-style-type: none"><li>• Rules of academic honesty (protocol of the Council No. 3 October 30, 2018 . .);</li><li>• Anti-corruption standard (Order No. 373 Н/К December 27, 2019).</li><li>• Code of ethics (protocol of the Council No. 8 January 31, 2020).</li></ul>
<b>Legal framework for the development of EP</b>	<ol style="list-style-type: none"><li>1. Law of the Republic of Kazakhstan "Education";</li><li>2. Standard rules of activity of educational organizations implementing educational programs of higher and (or) postgraduate education, approved by Order of the Ministry of Education and Science of the Republic of Kazakhstan dated October 30, 2018 No. 595 with amendments and additions dated December 29, 2021 No. 614</li><li>3. State obligatory standard of higher and after university education approved by order of the Ministry of sciences and higher education of the Republic of Kazakhstan, 20. 06. 2022 No. 2;</li><li>4. Rules of organizations of the educational process on credit technology training approved by order of the Ministry of Education and Science of the Republic of Kazakhstan, April 20, 2011 No. 152;</li></ol>

5. Qualifying directory posts managers, professionals and other employees, approved by order Minister labor and social protection population Republic Kazakhstan, December 30, 2020 No. 553.

6. Management on using ECTS.

7. Management on developing educational programs higher and after university education, appendix 1 to the order at directors TsBPIAM No. 45 o /д, June 30, 2021

**About the organization of educational process**

- Implementation principles Bologna process
- With a student center education
- Availability
- Inclusiveness

**Ensuring the quality of the EP**

- In the interior system ensure quality
- Attraction of stakeholders to the development of the EP and its evaluation
- Systematic monitoring
- Content update (update)

**Requirements for applicants**

U are established in accordance with the Model Rules for Admission to Education in Educational Organizations Implementing Educational Programs of Higher and Postgraduate Education Order of the Ministry of Education and Science of the Republic of Kazakhstan, No. 600 October 31, 2018

**Conditions for the implementation of educational programs (EP) for persons with disabilities and special educational needs (SSN)**

For students with SEN (special educational needs) and persons with disabilities (PSI), tactile PVC tiles, specially equipped toilets, a mnemonic diagram, and shower bars have been installed in educational buildings and student dormitories. Special parking spaces have been created. Crawler lift installed. There are desks for people with limited mobility (PLM), signs indicating the direction of movement, ramps. In the educational buildings (main building, building No. 8) there are 2 rooms with six working places adapted for users with disorders of the musculoskeletal system (DMS). For visually impaired users, the SARA™ CE Machine (2 pcs.) is available for scanning and reading books. The library website is adapted for the visually impaired. There is a special NVDA audio program with a service. The JIC website <http://lib.ukgu.kz/> is open 24/7.

An individual differentiated approach is provided for all types of classes and in the organization of the educational process.

## 2. EP PASPORT

<b>Purpose of EP</b>	Preparation of highly qualified, competitive masters with conceptual knowledge in the field of experimental and applied physics, able to choose methods and means of solving the task, carrying out scientific activities.
<b>EP Tasks</b>	<ul style="list-style-type: none"> <li>– meeting the needs of the individual in intellectual, cultural and moral development by obtaining higher postgraduate education;</li> <li>- training of masters, teachers of physics, capable of successfully mastering related areas of professional activity, as well as advanced training, training in additional education programs and continuing education in doctoral studies;</li> <li>– meeting the needs of society in qualified specialists in the field of education and teaching physics in universities that are able to integrate academic values with entrepreneurial ideas;</li> <li>- development of a favorable educational environment for the implementation of professional, cultural and linguistic needs of students ;</li> <li>– formation of a deep professional understanding of fundamental problems and practical methods for their solution in the field of physics and methods of teaching physics and its applications in scientific and pedagogical activities;</li> <li>- the formation of professional ability to plan and independently conduct effective scientific and pedagogical work, as well as to critically evaluate its results;</li> <li>- the formation of the ability to adapt and apply general methods of solution to the solution of non-standard problems;</li> <li>- preparation for professional activities at a university, research institute, in production or doctoral studies.</li> </ul>
<b>Harmonization of EP</b>	<ul style="list-style-type: none"> <li>• 7<sup>th</sup> level of the National Qualifications Framework of the Republic of Kazakhstan;</li> <li>• Dublin descriptors of the 7<sup>th</sup> level of qualification;</li> <li>• 2 cycle of a Framework for Qualification of the European Higher Education Area);</li> <li>• • 7<sup>th</sup> Level of European Qualification Framework for Life long Learning).</li> </ul>
<b>Connection of EP with the professional sphere</b>	Professional standard "Teacher", approved by the order of the Chairman of the Board of the National Chamber of Entrepreneurs of the Republic of Kazakhstan "Atameken" No. 133 dated June 8 , 2017 .
<b>Name of the degree awarded</b>	After the successful completion of this EP, the graduate is awarded the degree of Master of Natural Sciences of the EP «7M05310-Physics».
<b>Scroll qualifications and positions</b>	Masters in OP «7M05310-Physics» can hold positions of a physics teacher in universities, colleges and a researcher in research institutions.
<b>Sphere of professional activity</b>	– -the field of experimental and applied physics and education, scientific activity in the field of science and innovation.
<b>Objects of professional activity</b>	<ul style="list-style-type: none"> <li>– higher, secondary and secondary specialized educational institutions (universities, colleges, educational institutions of technical and vocational education),</li> <li>– management organizations: state educational authorities, departments of education.</li> </ul>
<b>Subjects of professional activity</b>	- physical systems of various scales and levels of organization, processes of their functioning; physical, engineering-physical, biophysical, chemical-physical, medical-physical, environmental technologies; physical expertise and

	<p>monitoring.</p> <ul style="list-style-type: none"> <li>- - scientific process, theoretical and experimental methods of scientific research;</li> <li>- the educational process in the unity of its value-target orientations, content, methods, forms and results;</li> <li>- innovative, informational and analytical activities in the field of physics, pedagogy and teaching methods.</li> </ul>
<b>Types of professional activity</b>	<p style="text-align: center;"><i>pedagogical and educational:</i></p> <ul style="list-style-type: none"> <li>– organization of the educational process at different levels of the education system ( organization of the process of education and upbringing, design and management of the pedagogical process, diagnostics, correction, prediction of the results of pedagogical activity);</li> <li>– preparation and conduct of classes in physics and informatics;</li> <li>– management of scientific work of students;</li> <li>– conducting optional classes in physics and informatics;</li> <li>– organization of cultural and leisure work with young students in the field of education, development of programs, methods and technologies for educational work in the field of physics and computer science, as well as its scientific and technical achievements.</li> </ul> <p><i>research :</i></p> <ul style="list-style-type: none"> <li>– conducting scientific research on the problems posed in the field of education;</li> <li>- selection of the necessary research methods;</li> <li>– formulation of new tasks arising in the course of scientific research;</li> <li>– work with scientific literature using new information technologies, tracking scientific periodicals;</li> <li>– analysis of the received scientific information using modern computer technology.</li> </ul> <p><i>scientific and innovative :</i></p> <ul style="list-style-type: none"> <li>– application of the results of scientific research in innovative activities;</li> <li>– development of new methods of scientific and pedagogical activity;</li> <li>– participation in the formulation of new tasks and the development of new methodological approaches in scientific and innovative research;</li> <li>– processing and analysis of the received data with the help of modern information technologies.</li> </ul> <p><i>organizational and managerial :</i></p> <ul style="list-style-type: none"> <li>– participation in the organization of research and scientific and innovative work;</li> <li>– participation in the organization of seminars, conferences;</li> <li>– preparation of abstracts, writing and design of scientific articles;</li> <li>– participation in the preparation of applications for grant competitions and the preparation of scientific and pedagogical projects, reports and patents.</li> </ul>
<b>Learning Outcomes</b>	<p><b>LO 1</b> He is able to design and carry out complex research, including interdisciplinary, using knowledge in the field of history and philosophy of science, as well as physics.</p> <p><b>LO 2</b> He is able to independently use modern methods and technologies of communication in a foreign language to solve problems of professional and scientific activity, as well as to create a psychological climate conducive to the optimal work of the team.</p> <p><b>LO 3</b> He is capable of psychological analysis, solving organizational problems and the quality of the implementation of his managerial functions by the head.</p> <p><b>LO 4</b> He is able to carry out teaching activities at a professional level, using innovative and digital technologies, interactive teaching methods and the experience of foreign</p>

	<p>scientists, as well as using the results of modern research in the field of experimental and applied physics.</p> <p><b>LO 5</b> It is capable of determining the structure, composition and physical properties of metals and alloys, surfaces and thin films using experimental methods of condensed matter physics.</p> <p><b>LO 6</b> He is able to independently set specific tasks of scientific research in the field of physics, solving them with the help of physical research methods and digital technologies using domestic and foreign experience.</p> <p><b>LO 7</b> He is able to apply methods of obtaining and converting energy from alternative sources into electrical energy, using the experience of foreign scientists, determining the parameters of installations that convert energy from alternative sources into electrical energy.</p> <p><b>LO 8</b> He is able to use modern instrumental methods to diagnose the properties of materials and products made of them.</p> <p><b>LO 9</b> It is able to use structural analysis methods to determine the properties, characteristics and parameters of materials, while taking into account the possibilities of various methods.</p> <p><b>LO 10</b> He is able to demonstrate the skills of performing independent scientific research in the field of physical fundamentals of materials science, analyze current trends in its development.</p>
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## 2. COMPETENCES OF THE GRADUATE OF EP

### SOFTSKILLS (Behavioral skills and personality qualities)

SS 1. Competence in managing one's own literacy	SS1.1. Strive for professional and personal growth throughout life. SS 1.2. Constantly update own knowledge within the chosen trajectory and in an interdisciplinary environment, carry out further learning with a high degree of independence and self-regulation. SS 1.3. To be capable of reflection, an objective assessment of one's achievements, an awareness of the need to form new competencies and continue education in doctoral studies.
SS 2. Language competence	SS2.1. The ability of possessing a sufficient level of communication in the professional field in the state, Russian and foreign languages for negotiating and business correspondence. SS 2.2. The ability of mastering the skills of mediation and intercultural understanding.
SS 3. Mathematical Competence and Competence in the field of Science	SS3.1. The ability to interpret the methods of mathematical analysis and modeling for solving applied problems in the field of study. SS3.2. The ability to plan the setting of scientific experiments, integrate and implement the results of scientific research in the professional field. SS 3.3. The ability to analyze and comprehend modern methods of pedagogical and psychological science and apply them in pedagogical activity.
SS 4. Digital competence, technological literacy	SS 4.1. The ability to confidently use modern information and digital technologies, artificial intelligence systems for work, leisure and communications. SS 4.2. Proficiency in the use, recovery, evaluation, storage, production, presentation and exchange of information in a wide range of digital devices. SS 4.3. Ability to confidently use global information resources and apply technological literacy in research and computational and analytical activities.
SS 5. Personal, social and academic competencies	SS 5.1. Possession of the norms of business ethics, social and ethical values and focus on them in professional activities. SS 5.2. Formation of a personality capable of mobility in the modern world, critical thinking and physical self-improvement. SS 5.3. Ability to work in a team, correctly, clearly and reasonably defend one's position during discussions and make decisions of a professional nature. SS 5.4. Ability to adequately navigate in various social spheres of activity and in conditions of uncertainty. SS 5.5. Ability to find compromises, correlate own opinion with the opinion of the team.
SS 6. Entrepreneurial competence	SS 6.1. The manifestation of leadership qualities and the ability to have a positive impact on others, to lead a team. SS 6.2. The ability to create conditions for the development of creative and entrepreneurial skills of the team. SS 6.3. The ability to work in a mode of uncertainty and rapidly

SS 7. Cultural awareness and ability to express yourself	<p>changing task conditions, make decisions, respond to changing working conditions, allocate resources and manage your time.</p> <p>SS 6.4. Ability to work with consumer needs.</p> <p>SS7.1. The ability to show worldview, civil and moral positions.</p> <p>SS7.2. The ability to be tolerant of the traditions and culture of the peoples of the world, to have high spiritual qualities.</p>
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### **HARDSKILLS**

Theoretical knowledge, practical skills and abilities specific to this area	<p>PC1 ability to independently set specific tasks of scientific research in the field of methods of teaching physics and solve them with the help of information technology and the use of the latest domestic and foreign experience.</p> <p>PC2 the ability to apply knowledge of physics and methods of teaching physics to solve scientific and innovative problems, and apply the results of scientific research in innovative scientific and pedagogical activities.</p> <p>PC3 ability to participate in the development of new methods and methodological approaches in scientific and innovative research and teaching activities</p> <p>PC4 the ability to plan, organize and conduct research, scientific seminars and conferences in the field of education and physics.</p> <p>PC5 ability to prepare and execute scientific and pedagogical documentation, scientific reports, reviews, reports and articles.</p> <p>PC6 ability to lead research activities of students in the field of physics and methods of teaching physics.</p> <p>PC7 the ability to methodically competently build lesson plans for the sections of academic disciplines in physics and publicly present the theoretical and practical sections of these disciplines in accordance with the approved teaching AIDS.</p>
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### 3. 1 Mapping matrix learning outcomes for the EP as a whole with the formed competencies

	LO1	LO 2	LO 3	LO 4	LO 5	LO 6	LO 7	LO 8	LO 9	LO 10
SS1	+	+		+		+				+
SS2		+		+		+	+			
SS3			+		+	+	+			+
SS4		+		+		+				
SS5	+		+	+	+					+
SS6		+	+							+
SS7	+	+								
PC1	+	+	+	+	+	+	+	+	+	
PC2	+	+	+	+			+		+	
PC3			+	+	+	+		+	+	+
PC4	+	+		+	+			+	+	
PC5	+	+		+	+			+		

**4 . INFLUENCE MATRIX FOR DISCIPLINE FORMATION OF EDUCATIONAL OUTCOMES AND INFORMATION ON LABOR INTENSITY**

№	Module name	Cycle	component	Name of the discipline	Brief description of the discipline	Credits	Formed educational outcomes (codes)												
							EO1	EO2	EO3	EO4	EO5	EO6	EO7	EO8	EO9	EO10			
1	Module of Scientific and pedagogical training	BD	UC	<b>History and philosophy of science</b>	<p><b>Purpose:</b> to form an objective view of the history and philosophy of science based on a deep understanding and scientific analysis of the main stages, patterns of modern methods of scientific cognition.</p> <p><b>Contents:</b> The main laws of the development and functioning of science, philosophical and methodological foundations of modern methods of scientific cognition. Methodological apparatus of modern history and philosophy of science. Formation of a scientific and methodological worldview based on knowledge of the features of modern science. Actual problems of the history and philosophy of science, the ability to actively use the acquired knowledge of history and methodology in scientific research.</p>	4	v												
2		BD	UC	<b>Foreign language (professional)</b>	<p><b>Purpose:</b> formation of intercultural and communicative competence of undergraduates in the process of foreign language education at a sufficient level. presentation of scientific information in various fields of communication, methods of annotation, abstracting and translation of literature in the specialty.</p> <p><b>Contents:</b> General scientific, special terminology, grammatical material sufficient for the implementation of oral and written communication in business and professional communication, methods of oral, written and electronic communication in English. Stylistic features of oral and written scientific discourse, rational methods of working with texts. Rules for the presentation of scientific information in various fields of communication</p>	4		v	v										

3		BD	UC	<b>Psychology of management</b>	<p><b>Purpose:</b> formation of knowledge of modern trends, current problems and methods of psychology development, skills of system analysis of psychological phenomena. explanation of modern trends in scientific management</p> <p><b>Contents:</b> Psychological theories and management methods, modern trends in scientific management. Methodological analysis of the problem of personality psychology, psychological characteristics of personality, management methods taking into account psychological patterns. Management processes, psychological knowledge and skills in the context of their application in the practice of self-knowledge, communication, professional and personal growth.</p>	4			v							
4	<b>Methodological bases of teaching</b>	BD	UC	<b>Higher school Pedagogy</b>	<p><b>Purpose:</b> formation of readiness for systematic design and construction of scientific and pedagogical activity.</p> <p><b>Contents:</b> Patterns of development of the higher education system; the essence, content, pedagogical patterns of the educational process of higher education. Modern approaches to the design of scientific and pedagogical activity. The main forms, technologies, methods and means of organizing the processes of education and upbringing, methods of pedagogical communication with participants in the educational process. Examples of the use of digital technologies in the implementation of the educational process.</p>	4		v		v						
5		PD	UC	<b>Teaching Methods of special disciplines</b>	<p><b>Purpose:</b> to get acquainted with the methodological foundations of working with the material of natural science orientation, the formation of an integrated approach to teaching sections of applied and experimental physics.</p> <p><b>Contents:</b> Planning and conducting training sessions taking into account the specifics of applied and experimental physics, the use of scientifically based methods and means of teaching physics, scientific and methodological analysis of sections of applied and experimental physics. Ways of implementing modern technologies in teaching, their selection and design depending on the age capabilities of students and the content of the material being studied.</p>	5		v		v						

6		BD	UC	<b>Pedagogical practice</b>	<p><b>Purpose:</b> development of general cultural and improvement of professional competencies; familiarization with the specifics of teaching at the professional level,</p> <p><b>Contents:</b> During the internship, undergraduates get acquainted with the specifics of teaching activities at a professional level, carry out pedagogical activities based on the knowledge gained in teaching disciplines of the specialty of physics; apply innovative and digital technologies, interactive teaching methods, monitor student progress, learn to make syllabuses and develop the UMK of physics disciplines, makes a report on practice.</p>	4		v		v						
7	<b>Solid state physics</b>	PD	EC	<b>Alloys with special physical properties</b>	<p><b>Purpose:</b> formation of knowledge about alloys with special physical properties; modern directions of rational choice of alloys for the manufacture of structural parts and their applications.</p> <p><b>Contents:</b> Classification of alloys by types of physical properties, applications and production technology. Basic approaches to the study and formation of the physical properties of alloys. Features of the formation of physical properties of alloys and their change under the influence of various factors. Research and formation of physical properties of alloys, rational choice of alloys for the manufacture of structural parts.</p>	5	v			v	v					
8		PD	EC	<b>Physics of metals and alloys</b>	<p><b>Purpose:</b> familiarization with the laws describing the equilibrium states of metals and alloys, the applications of various metals and alloys in technology; the development of scientific thinking.</p> <p><b>Contents:</b> On the basis of theoretical concepts, the dependence of the physical properties of metals and alloys on the microstructure is analyzed and predicted. Composition, density of crystal lattice defects, positions in the periodic table of elements, phase state and temperature. Methods of physical analysis for solving problems of physics of metals and alloys. Principles of formation of physical properties in metals and alloys.</p>		v			v	v					v

9		BD	EC	<b>Physics of the Surface of Solids</b>	<p><b>Purpose:</b> to familiarize with the scientific foundations of the physics of surfaces and thin films, changes in the atomic structure on the surface of solids.</p> <p><b>Contents:</b> Theory and features of physico-chemical properties of the surface of solids. Changing the atomic structure on the surface – relaxation, reconstruction, faceting. Mechanisms responsible for structural restructuring, transformation of the electronic structure, which is the cause of surface states. Methods of research and solving problems in the field of surface physics and thin films.</p>	6	v					v	v					v
10		BD	EC	<b>Methods for studying the surface of solids</b>	<p><b>Purpose:</b> to familiarize with the methods of studying the physicochemical properties of the surface of solids, as well as the application of research methods in production.</p> <p><b>Contents:</b> Physico-chemical bases and analytical capabilities of experimental methods for studying the structure, properties and composition of surfaces and thin layers of materials in order to diagnose micro- and nanostructures. Interpretation of the obtained data and establishment of the chemical nature of the samples. Application of research methods in the production of electronic products.</p>		v					v	v					v
11	Module selected chapters of the physics course	PD	EC	<b>Selected chapters in solid state physics</b>	<p><b>Purpose:</b> to study selected chapters, laws and theory of solid state physics, methods of their physical research.</p> <p><b>Contents:</b> Fundamental concepts, laws and theories of solid state physics. Methods of theoretical approaches in the description and study of phenomena in solids and methods of their physical research. Methods of processing the received data. The relationship between the structure, formation conditions and properties of promising crystalline materials, as well as the results of theoretical and experimental studies.</p>	5	v	v					v					v
12		PD	EC	<b>Selected chapters of General Physics</b>	<p><b>Purpose:</b> introduction to the theories and methods of modern physics of semiconductors and dielectrics used in electronics and optoelectronics.</p> <p><b>Contents:</b> Modern physical methods for studying the basic electrophysical and optical properties of semiconductor materials used in electronics, including optoelectronics. Prospects for the development of semiconductor physics for solving the problems of production of modern electronic and optoelectronic equipment. The possibilities of micro- and nanoelectronics technologies in controlling the properties of semiconductor materials.</p>		v	v					v					v

13		BD	EC	<b>Selected chapters of the general physics</b>	<p><b>Purpose:</b> familiarization with the scientific foundations of the course of general physics and methods of research of physical phenomena and processes.</p> <p><b>Contents:</b> Philosophical and methodological problems of physics. Physical models, limitations and limits of their applicability. Methods of mathematical description and methods of research of physical phenomena and processes. The role of physics in solving global problems of mankind: energy, environmental. Examples of calculations of scientific and engineering-physical problems.</p>	4	v	v					v				
14		BD	EC	<b>Selected chapters of the course of atomic and nuclear physics</b>	<p><b>Purpose:</b> mastering the basic methods of atomic and nuclear physics research, mastering its methods for their use in professional activities.</p> <p><b>Contents:</b> Basic laws and phenomena of the microcosm, features of multielectronic atoms and molecules, interaction of radiation and matter, basic methods of atomic and nuclear physical research. Methods for solving problems in the field of atomic and nuclear physics. Evaluation and engineering calculations of the results of nuclear transformations.</p>		v	v					v				
15	<b>Physics of modern high tech</b>	PD	EC	<b>Selected Chapters of High Technology Physics</b>	<p><b>Purpose:</b> familiarization with selected chapters of high-tech physics and quantum theory of radiation.</p> <p><b>Contents:</b> Principles of operation of the main elements of semiconductor microelectronics. Modern technologies for the production and assembly of semiconductor chips, the use of microelectronics. Quantum theory of radiation and interaction of light with matter, quantum amplifiers and light generators. Practical application of lasers. The physical foundations of EMR and EPR, and examples of their application in practice.</p>	6	v	v					v				v
16		PD	EC	<b>Alternative sources of electrical energy</b>	<p><b>Purpose:</b> familiarization with renewable energy sources and methods of obtaining and converting energy, .acquisition of knowledge on the basics and trends in the development of modern devices that convert electromagnetic energy.</p> <p><b>Contents:</b> Alternative energy sources, methods of obtaining and converting energy from non-traditional and renewable sources into electrical energy. Prospects for the development of alternative energy sources, methods of theoretical and experimental research of alternative sources. Examples of calculating the parameters of installations that convert energy from alternative sources into electrical energy.</p>		v	v					v	v			



17		PD	EC	<b>The Basic principles of modern physics</b>	<b>Purpose:</b> to familiarize with the potential of scientific discoveries and the practical consequences of achievements in the field of physics. <b>Contents:</b> Basic phenomena of physics and their practical applications; development of nuclear physics and elementary particle physics. Interrelation and mutual influence of the basic concepts, principles and theories of physics. Concepts of space and time, principles of symmetry and conservation laws. Research methods in various fields of physics. Observed natural phenomena from the perspective of the laws of physics.	4	v	v					v			
18		PD	EC	<b>Modern problems of astrophysics</b>	<b>Purpose:</b> to familiarize with the basic postulates underlying modern cosmology; methods of photometric, spectroscopic, astronomical observations and the main tasks of astrophysics. <b>Contents:</b> Physical processes responsible for the nature and observable features of space objects and phenomena; features of the main processes occurring at the stages of evolution of the Universe. The main postulates underlying modern cosmology. Photometric and spectroscopic methods of astronomical observations on large telescopes and processing of observation results, as well as methods for solving astrophysics problems.		v	v					v			
19	<b>Scientific and experimental research methods</b>	PD	EC	<b>Methods of non-destructive testing in production</b>	<b>Purpose:</b> familiarization with modern methods of testing and control at all stages of material processing; physical principles of operation of diagnostic equipment. <b>Contents:</b> Types of technological defects, physical principles of diagnostic equipment operation (ultrasonic flaw detection, magnetic and electrical control method). Evaluation of the possibilities of research methods. Theory of the structure of materials. Modern methods of testing and control at all stages of material processing, the relationship between the composition, structure and properties of materials, taking into account the operational requirements for the product.	6							v		v	v

20		PD	EC	<b>Physics of Strength and Plasticity</b>	<p><b>Purpose:</b> to study the theory of strength and plasticity of materials and methods for determining the mechanical characteristics of materials.</p> <p><b>Contents:</b> Theory of strength and plasticity of materials based on the analysis of the patterns of occurrence, movement and interaction of defects of materials in the field of applied stresses. Methods for determining the mechanical characteristics of materials. Interrelation of material properties with its microstructure and dislocation structure features; solution of applied problems of metal physics, results of mechanical tests of various materials.</p>		v						v		v		v
21		BD	EC	<b>Experimental methods of solid state physics</b>	<p><b>Purpose:</b> familiarization with experimental methods of studying the structure and properties of solids: scanning probe, electron microscopy, optical, X-ray methods of research, etc.</p> <p><b>Contents:</b> Experimental methods for studying the structure and properties of solids, such as various types of microscopy (scanning probe, electronic), optical, X-ray research methods, etc. The possibilities of interpreting the information obtained using these methods. Theoretical provisions of the issues under consideration. The practical significance of the acquired knowledge on the example of modern achievements in the field of solid state physics.</p>	5						v	v		v	v	v
22		BD	EC	<b>Experimental methods for investigation physical phenomena</b>	<p><b>Purpose:</b> to master the basic experimental methods of studying physical phenomena, methods of estimating measurement errors.</p> <p><b>Contents:</b> Fundamentals of the theory of measurement errors; the physical foundations underlying the experimental method of studying this property, the main experimental schemes for measuring this property. Possibilities for improving classical experimental schemes. Methods for estimating measurement errors, examples of experimental measurement of temperature, pressure, density, viscosity and thermal conductivity of bodies.</p>							v	v		v	v	v
23		PD	EC	<b>Diffraction structural analysis</b>	<p><b>Purpose:</b> to study the fundamentals of the theory of diffraction on a crystal and methods for determining the atomic structure of matter.</p> <p><b>Contents:</b> Fundamentals of the theory of diffraction on a crystal. Methods for determining the atomic structure of a substance from diffraction data, their possibilities and limitations. An idea of the methodology and capabilities of diffraction analysis of non-crystalline materials. Features of the use of various types of radiation – X-rays, neutrons and electrons.</p>	6	v									v	v

24		PD	EC	<b>Modern methods of structural analysis</b>	<p><b>Purpose:</b> familiarization with modern physical methods of structural analysis and characteristics, parameters of solids.</p> <p><b>Contents:</b> The basic set of physical methods of structural analysis as a single system that allows you to measure or calculate most of the known properties, characteristics and parameters of solids. The physical phenomena underlying the methods; the fundamental and real possibilities of various methods. Features of the methods, requirements for the samples under study and the equipment used.</p>		v									v	v
25				<b>Research practice</b>	<p><b>Purpose:</b> to gain experience in independent research activities. Familiarization with the devices of measuring instruments, modern methods of scientific research.</p> <p><b>Contents:</b> The research practice of a master's student is conducted in order to familiarize with the latest theoretical, methodological and technological achievements of domestic and foreign science, modern methods of scientific research, processing and interpretation of experimental data.</p>	6			v		v		v				
26	Structure and properties of materials			<b>Physical fundamentals of Materials Science</b>	<p><b>Purpose:</b> familiarization with the physical fundamentals of materials science used in various technical industries and methods for determining the physical properties of materials.</p> <p><b>Contents:</b> Electronic and atomic crystal structures of solids, structural and phase transformations, physical properties (electrical, magnetic, mechanical, etc.) of conducting, semiconductor and dielectric materials. The relationship between the atomic-electronic structure, composition and various physical properties of materials used in various technical industries. Behavior of solids in a wide range of temperatures and pressures. Methods for determining the physical properties and evaluating the functional characteristics of materials.</p>	5							v	v	v	v	v
27				<b>Crystallography and structural analysis</b>	<p><b>Purpose:</b> to study the basic concepts and elements of structural crystallography and the structure of crystalline substances, as well as crystallographic calculation methods.</p> <p><b>Contents:</b> A systematized view of the laws of the structure of crystalline substances, as well as crystallographic methods for calculating and modeling crystal structures. Basic concepts and elements of structural crystallography, analysis of the main structural types of crystalline materials. The use of international crystallographic tables to describe crystal structures.</p>								v	v	v	v	v

28				<b>Modern methods of materials research</b>	<p><b>Purpose:</b> familiarization with modern methods of materials research and principles of operation of research equipment, research methods.</p> <p><b>Contents:</b> Physical phenomena on which research methods are based, principles of operation of research equipment, research methods. Practical possibilities and limitations of the most important methods of materials research at various stages of their production, processing, processing and operation, experimental conditions. Methods of processing the obtained results and evaluation of experimental data.</p>	5								v	v	v	v
29				<b>Physical foundations of optoelectronics and renewable energy sources</b>	<p><b>Purpose:</b> to study the physical foundations of optoelectronics and renewable energy sources and promising areas for the development of optoelectronics.</p> <p><b>Contents:</b> The main physical phenomena in solids, which are the basis for the work of the basic elements of modern optoelectronics: photoresistors, photodetector elements based on photoedcs of various nature, solid-state and semiconductor lasers, LEDs, information display devices based on liquid crystal matrices. Promising directions of development of the element base of optoelectronics, principles of construction of optoelectronic devices, as well as physical concepts of non-traditional and renewable energy sources, the possibility of their use.</p>									v	v	v	v
30	<b>Module of research work and final attestation</b>			<b>Research work of a master student, including passing an internship and completing a master's thesis</b>	<p><b>Purpose:</b> to consolidate the theoretical knowledge gained and to master the practical skill of formulating a scientific problem, its research and substantiation of solutions.</p> <p><b>Content:</b> Preparation of a dissertation plan, a list of used literature. Performing a scientific review on the topic of the study, based on the results of which the article is being prepared. Processing of scientific, secondary information on the topic of the dissertation. Development of modern research methods, research tools. Solving research problems, using modern methods of processing, verification and presentation of scientific data. Preparation of an article, dissertation and abstract.</p>	24								v	v	v	v

31			<p><b>Execution and defense of the master's project</b></p>	<p><b>Purpose:</b> to gain the skills to perform and design research work and the ability to defend their point of view.  <b>Content:</b> Preparation of the dissertation work according to the requirements for such works. Presentation of a scientific report on the main results of the prepared dissertation, carried out on the basis of the results of research work. When defending a dissertation, a master's student must demonstrate his research and pedagogical competencies acquired during his master's studies and their compliance with the requirements of the educational program.</p>	8								v	v
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**5. SUMMARY TABLE SHOWING THE VOLUME OF LOANS DISPLACED  
IN THE SECTION OF OP MODULES**

Course of Study	Semester	Number of modules being mastered	Number of disciplines studied			Number of KZ credits					Total hours	Total credits KZ	Quantity	
			CC	VC	EC	Theoretical training	Ped. practice	Research practice	Scientific research work of a master student,	final examination			copy	differential standings
1	1	3		5	2	29		-	1	-	900	30	6	2
	2	4		1	3	23	4		3	-	900	30	4	2
2	3	2			3	21		7	2	-	900	30	3	2
	4	1			0	0		-	18	12	900	30		1
Total				6	8	66	8	12	24	12	3600	120	13	7

## 6. STRATEGIES AND METHODS OF TRAINING, MONITORING AND EVALUATION

<p><b>Strategies and learning</b></p>	<p><b>Student - centered learning:</b> the learner is the center of teaching/learning <b>and an active</b> participant in the process of learning and decision-making.  <b>Practice-oriented learning:</b> focus on the development of practical skills.</p>
<p><b>Teaching methods</b></p>	<p>Conducting lectures, seminars, various types of practices with:</p> <ul style="list-style-type: none"> <li>• application of innovative technologies: <ul style="list-style-type: none"> <li>• problem learning;</li> <li>• case study;</li> <li>• group work and creative groups;</li> <li>• discussions and dialogues, intellectual games, olympiads, quizzes;</li> <li>• methods of reflection, projects, benchmarking;</li> <li>• Bloom's taxonomy;</li> <li>• presentations;</li> </ul> </li> <li>• rational and creative use of information sources : <ul style="list-style-type: none"> <li>• multimedia educational programs ;</li> <li>• electronic textbooks ;</li> <li>• digital resources .</li> </ul> </li> </ul> <p>Organization of independent work of students, individual consultations.</p>
<p><b>Monitoring and the of assessing achievability learning outcomes</b></p>	<p><b>Current control</b> on each topic of the discipline, control of knowledge in classroom and extracurricular activities ( <i>according to the syllabus</i> ). Evaluation forms:</p> <ul style="list-style-type: none"> <li>• surveys;</li> <li>• testing topics of academic discipline;</li> <li>• test papers;</li> <li>• protection of independent creative works;</li> <li>• discussions;</li> <li>• trainings;</li> <li>• colloquia;</li> <li>• essay , etc.</li> </ul> <p><b>R intermediate control</b> at least two times during one academic period within the same academic discipline.  <b>Intermediate certification</b> is carried out in accordance with the working curriculum, academic calendar.  Conduct forms:</p> <ul style="list-style-type: none"> <li>• examination in the form of testing;</li> <li>• oral exam;</li> <li>• a written exam;</li> <li>• combined exam;</li> <li>• protection of projects;</li> <li>• protection of reports on practices .</li> </ul> <p><b>Final state certification.</b></p>

## 7. TRAINING AND RESOURCE SUPPORT OF THE EP

<p><b>Information Resource Center</b></p>	<p>The structure of the OIC includes 6 subscriptions, 16 reading rooms, 2 electronic resource centers (ERC). The network infrastructure of the JIC is based on 180 computers with Internet access, 110 workstations, 6 interactive whiteboards, 2 video doubles, 1 video conferencing system, 3 A-4 format scanners, the JIC software - AIBS "IRBIS-64" under MS Windows (basic set of 6 modules), stand-alone server for uninterrupted operation in the IRBIS system.</p> <p>The library fund is reflected in the electronic catalog available to users on the site <a href="http://lib.ukgu.kz">http://lib.ukgu.kz</a> on -line 24 hours 7 days a week.</p> <p>Thematic databases of their own generation have been created: "Almamater", "Proceedings of SKSU scientists", "Electronic archive". Online access from any device 24/7 via external link <a href="http://articles.ukgu.kz/ru/ppp">http://articles.ukgu.kz/ru/ppp</a>.</p> <p>Catalogs are processed electronically. EC consists of 9 databases: "Books", "Articles", "Periodicals", "Proceedings of the teaching staff of SKSU", "Rare Books", "Electronic Fund", "SKSU in Print", "Readers" and "SKR".</p> <p>The JIC provides its users with 3 options for accessing its own electronic information resources: from the "Electronic Catalog" terminals in the catalog hall and divisions of the JIC; through the information network of the university for faculties and departments; remotely on the website of the library <a href="http://lib.ukgu.kz/">http://lib.ukgu.kz/</a>.</p> <p>Open access to international and republican resources: "SpringerLink", "Polpred", "Web of Science", "EBSCO", "Epigraph", to electronic versions of scientific journals in the public domain, "Zan", "RMEB", "Adebiet", Digital library "Aknurpress", "Smart-kitar", "Kitar.kz", etc.</p> <p>For people with <i>special needs</i> and disabilities, the library website has been adapted to the work of visually impaired users</p>
<p><b>Material and technical base</b></p>	<p>For the preparation of undergraduates in this direction, there is an appropriate material and technical base of the specialty, that is, classrooms, laboratories, a computer class that meets the requirements of the SES. The Department of Physics includes 6 classrooms: mechanics and molecular physics, electromagnetism, the TSE Laboratory and astronomy, optics, atomic and nuclear physics (an interactive whiteboard is installed here) and a computer class.</p> <p>There is a specialized scientific and technical experimental base in the laboratories of the center "SAPA" and "IRLIP", where EP 7M05310 - "Physics" meets sanitary and technical standards and provides all types of practical, disciplinary training, research work of undergraduates provided for in the working curriculum of the specialty.</p>



## APPROVAL SHEET

according to the Educational program «7M05310-Physics»

Director of AID  Naukenova A.S.

Director of DCS  Nazarbek U.B.

Director of the DEC  Bazhirov T.S.